GAS JOURNAL, FEB. 23, 1944

VOL. 243 96th YEAR No. 4214

EDITORIAL NOTES

FUTURE GAS DEMAND

THE Gas Industry, it would seem, is still in the throes of finding out what it intends to do—the place it will strive to occupy in the fuel picture—after the war, and of what it is in fact capable. There would appear to be no strong unanimity as to the lines of action which individual gas undertakings propose to take—whether they visualize and are preparing for extensions of load quite different from, and on a much larger scale than, those represented by the comparatively small annual increases recorded during the years immediately preceding the war. Were there national unanimity in this matter of thinking on the "grand scale," as it were, and of planning in a big and direct way to cope with future greatly increased demands for gas, there would, perhaps, be small reason for the Report of the Utilization Sub-Committee of the Post-War Planning Committee of the B.G.F.—a report presumably for Gas Industry consumption. At first glance it may seem to be somewhat of a trite document presented to the converted; its justification, therefore, must lie in this lack of unanimity in the Industry—in other words, lack of conversion universally to the big way of thinking. We ourselves like the report as a well-reasoned statement, though we think it is too apologetic in tone and is insufficiently dominant and forceful in its recommendations, when its purpose is surely to stir up the timid to more vigorous and more courageous thought and action. Naturally we hope the report has the desired result, for it appears to us sound enough as far as it goes.

The report has the merit of reasonable brevity. Let us take a glance at it. There is no need for us to dwell on the advantages which are known to accrue when gas and coke displace raw coal. We have expressed the view many times that for some time to come a proportion of the domestic heating requirements will be met by solid fuel, if only to prevent excessive peak demands for gas supply, and thereby to bring within limits which the public can afford to pay the overall cost of the fuel service. The Gas Industry's aim should be to supply gas and coke adequate in quantity and quality and at such a price that their use in entire replacement of raw coal is economically practicable. Demonstrably this can be done; and the report calls for the adherence of the whole Industry, *qua* Industry, to a general scheme, so that individual undertakings will be able to communicate the views of the Industry to local housing authorities. Through the numerous contacts of the national bodies of the Industry with Government Departments during the war, it is anticipated that after it is over regard will be had to the services which the Gas Industry can undertake in the housing programme —and it is suggested that there will be built some four million new houses in the years immediately following the war. The field offered by the use of gas and coke instead of coal is obviously one of great extent—and the Industry should cease to be hesitant as to its capability to cover this field. Electricity we have not yet mentioned. Its use domestically is bound to grow, but we agree entirely with the statement that the use universally of electrical energy in place of coal is a dream that must lead to embarrassment of that industry and to disillusionment on the score of cost. On the other hand, the Gas Industry has proved by experience that it can provide a smokeless fuel service acceptable to the public at a cost which the public can afford; and the Industry must set itself out on a national scale to give consumers competent advice on the complementary use of gas and coke, and this, of course, implies the availability of appliances wholly suitable for the purpose intended.

We have spoken of the primary contact of the Gas Industry, through its national bodies, with the Government Departments concerned with fuel supply and with housing, and the case is being made that a house cannot be considered as complete and ready for occupation unless it is provided with an adequate modern fuel system—that gas supply and internal pipes should be installed and included in the cost of every new building. That, as it were, is a national link, but it is only the first step, for representations to the central authorities are insufficient to ensure full development of fuel supply by the Gas Industry. It is here that the report under review suggests that there is no reason to believe that the central planning authorities will dictate to local authorities on matters of detail. Expectation is that broad principles will be established and codes of good practice formulated, but that final decisions as to the means by which the broad requirements are met will be left in the hands of local housing authorities. It follows that a second link between the Gas Industry and housing authorities must be established locally. To quote the report: "To ensure that each gas undertaking may move in harmony with the others and that each may have access to the information and facilities available, contact is desirable with the District Gas Associations, and, through them, with the national bodies. It is one of the objects of closer integration of the Gas Industry to ensure that advice and assistance are more readily obtainable by an undertaking which is in negotiation with a local housing authority." The necessity for this dual approach to housing authorities is apparent. Opportunities for ensuring local development must not be lost on the assumption that effective and over-ruling decisions will be made elsewhere. What we need is an agreed national policy on which joint constructive action can be taken.

FREEDOM OF CHOICE

TURNING from the general to the particular, and discussing the use of solid smokeless fuel to meet peak winter loads, thereby in effect reducing the price of gas to the consumer, the report maintains that a hot-water system provided by the coke boiler is insufficiently flexible to give either maximum economy in fuel or most convenient service during the warmer months, for which reason it should be supplemented by a gas-operated system. By using coke to avoid excessive seasonal peaks, gas can be offered under such a system of charge that a generous service of water heating and space heating can be given by gas without undue increase in cost to the consumer, while appreciable national economy in coal will result. Of course, there will be an increase in amenities. However, to obtain the advantages of the appropriate fuel for each season has normally required a duplication of appliances, obviously at added cost. And in this regard the report suggests there is no need necessarily for such duplication, and that a single appliance capable of water heating by gas in the summer and providing hot water and room heating by coke in the winter is within the capacity of the appliance manufacturers to design and produce.

The provision of facilities to afford the consumer a wide choice in the use of fuel in the home is advocated; and in this connexion there is pertinent observation on "freedom of choice" as enjoyed —or not enjoyed—in the past. Is it not true to say that the majority of people—through lack of sufficient money to alter or replace what in fact they do not like—have been unable to exercise any real freedom of choice over their fuel or fuel-using equipment? Pre-war conditions in the provision of equipment resulted in the tenant being saddled with the landlord's choice, for good or ill. And, as will be agreed, equipment provided hitherto has in most cases been inadequate. More adequate equipment suitable to the needs of the consumer—equipment

GAS JOURNAL, FEB. 23, 1944

VOL. 243 96th YEAR No. 4214

EDITORIAL NOTES

FUTURE GAS DEMAND

THE Gas Industry, it would seem, is still in the throes of finding out what it intends to do—the place it will strive to occupy in the fuel picture—after the war, and of what it is in fact capable. There would appear to be no strong unanimity as to the lines of action which individual gas undertakings propose to take—whether they visualize and are preparing for extensions of load quite different from, and on a much larger scale than, those represented by the comparatively small annual increases recorded during the years immediately preceding the war. Were there national unanimity in this matter of thinking on the "grand scale," as it were, and of planning in a big and direct way to cope with future greatly increased demands for gas, there would, perhaps, be small reason for the Report of the Utilization Sub-Committee of the Post-War Planning Committee of the B.G.F.—a report presumably for Gas Industry consumption. At first glance it may seem to be somewhat of a trite document presented to the converted; its justification, therefore, must lie in this lack of unanimity in the Industry—in other words, lack of conversion universally to the big way of thinking. We ourselves like the report as a well-reasoned statement, though we think it is too apologetic in tone and is insufficiently dominant and forceful in its recommendations, when its purpose is surely to stir up the timid to more vigorous and more courageous thought and action. Naturally we hope the report has the desired result, for it appears to us sound enough as far as it goes.

The report has the merit of reasonable brevity. Let us take a glance at it. There is no need for us to dwell on the advantages which are known to accrue when gas and coke displace raw coal. We have expressed the view many times that for some time to come a proportion of the domestic heating requirements will be met by solid fuel, if only to prevent excessive peak demands for gas supply, and thereby to bring within limits which the public can afford to pay the overall cost of the fuel service. The Gas Industry's aim should be to supply gas and coke adequate in quantity and quality and at such a price that their use in entire replacement of raw coal is economically practicable. Demonstrably this can be done; and the report calls for the adherence of the whole Industry, *qua* Industry, to a general scheme, so that individual undertakings will be able to communicate the views of the Industry to local housing authorities. Through the numerous contacts of the national bodies of the Industry with Government Departments during the war, it is anticipated that after it is over regard will be had to the services which the Gas Industry can undertake in the housing programme —and it is suggested that there will be built some four million new houses in the years immediately following the war. The field offered by the use of gas and coke instead of coal is obviously one of great extent—and the Industry should cease to be hesitant as to its capability to cover this field. Electricity we have not yet mentioned. Its use domestically is bound to grow, but we agree entirely with the statement that the use universally of electrical energy in place of coal is a dream that must lead to embarrassment of that industry and to disillusionment on the score of cost. On the other hand, the Gas Industry has proved by experience that it can provide a smokeless fuel service acceptable to the public at a cost which the public can afford; and the Industry must set itself out on a national scale to give consumers competent advice on the complementary use of gas and coke, and this, of course, implies the availability of appliances wholly suitable for the purpose intended.

We have spoken of the primary contact of the Gas Industry, through its national bodies, with the Government Departments concerned with fuel supply and with housing, and the case is being made that a house cannot be considered as complete and ready for occupation unless it is provided with an adequate modern fuel system—that gas supply and internal pipes should be installed and included in the cost of every new building. That, as it were, is a national link, but it is only the first step, for representations to the central authorities are insufficient to ensure full development of fuel supply by the Gas Industry. It is here that the report under review suggests that there is no reason to believe that the central planning authorities will dictate to local authorities on matters of detail. Expectation is that broad principles will be established and codes of good practice formulated, but that final decisions as to the means by which the broad requirements are met will be left in the hands of local housing authorities. It follows that a second link between the Gas Industry and housing authorities must be established locally. To quote the report: "To ensure that each gas undertaking may move in harmony with the others and that each may have access to the information and facilities available, contact is desirable with the District Gas Associations, and, through them, with the national bodies. It is one of the objects of closer integration of the Gas Industry to ensure that advice and assistance are more readily obtainable by an undertaking which is in negotiation with a local housing authority." The necessity for this dual approach to housing authorities is apparent. Opportunities for ensuring local development must not be lost on the assumption that effective and over-ruling decisions will be made elsewhere. What we need is an agreed national policy on which joint constructive action can be taken.

FREEDOM OF CHOICE

TURNING from the general to the particular, and discussing the use of solid smokeless fuel to meet peak winter loads, thereby in effect reducing the price of gas to the consumer, the report maintains that a hot-water system provided by the coke boiler is insufficiently flexible to give either maximum economy in fuel or most convenient service during the warmer months, for which reason it should be supplemented by a gas-operated system. By using coke to avoid excessive seasonal peaks, gas can be offered under such a system of charge that a generous service of water heating and space heating can be given by gas without undue increase in cost to the consumer, while appreciable national economy in coal will result. Of course, there will be an increase in amenities. However, to obtain the advantages of the appropriate fuel for each season has normally required a duplication of appliances, obviously at added cost. And in this regard the report suggests there is no need necessarily for such duplication, and that a single appliance capable of water heating by gas in the summer and providing hot water and room heating by coke in the winter is within the capacity of the appliance manufacturers to design and produce.

The provision of facilities to afford the consumer a wide choice in the use of fuel in the home is advocated; and in this connexion there is pertinent observation on "freedom of choice" as enjoyed —or not enjoyed—in the past. Is it not true to say that the majority of people—through lack of sufficient money to alter or replace what in fact they do not like—have been unable to exercise any real freedom of choice over their fuel or fuel-using equipment? Pre-war conditions in the provision of equipment resulted in the tenant being saddled with the landlord's choice, for good or ill. And, as will be agreed, equipment provided hitherto has in most cases been inadequate. More adequate equipment suitable to the needs of the consumer—equipment

which does not involve inescapable high costs in running and does not preclude the use of reasonable alternatives—is surely desirable. This principle of "freedom of choice" has detailed indication in the report.

This brings us to the Sub-Committee's recommendation of a "selected list of housing equipment." It is put forward that there should be a limited range of appliances having specified performances, available at low cost, from which selection can be made of individual items to form fuel equipment installations. The purpose of such a list would be "to provide performance specifications of a limited range of appliances which could be recommended with confidence in respect of service and life, while being available at the lowest cost consistent with good quality." Such a plan should make it easier to deal with those landlords who are inclined to provide shoddy appliances. A tentative list of suggestions is given in the report, but agreement demands the fullest co-operation of gas undertakings and appliance manufacturers. And the existence of such a list—designed to appeal to housing authorities and not to preclude the stimulus of competition in what may be termed the more expensive field—should, it is thought, make it easier to forecast the likely demand for the various appliances, a forecast for which the appliance manufacturers are asking and which they have a right to expect from gas undertakings.

TOWARDS THE MILLENNIUM?

So to the final question, whether one may expect revolutionary improvements to be brought about solely by a central authority. Perhaps not solely, but we hope that something may be done centrally much more drastically than the Report of the B.G.F. Sub-Committee seems to have in mind. There has been over the past three years such a tremendous volume of talk and script about the need for unity, co-operation, evolution from the base of the pyramid to its apex. It has resulted, we think, in more rancour and tightening of the parochial belt than has ever been witnessed in the whole of the Gas Industry's history. The Industry appears to have little faith in central authority, the while it meanders with the utmost "worthiness," of course, into closed pockets to discuss grumbles which soon become, among the pockets, firm convictions. To-day a large amount of Gas Industry talk is flavoured with the odour of central disintegration and the smell of political tripe. Just at a time when there ought to be agreed central authority guiding firmly yet flexibly tactical operation throughout the whole Industry, each individual unit contributing its efforts, not to a series of ephemeral whims (holding companies, private enterprise, municipal ownership, large or small, engineer *versus* chemist, with the accountant holding a watching brief and biding his time to "strike home"), but to an authority speaking, on behalf of the Industry, to Governmental authority beyond the ambit of its activities, there is widespread bickering.

When we were young we could not, or would not, buy the *Encyclopaedia Britannica*, partially, perhaps, because we could either borrow a part of it which interested us, or visit a public library and read for an hour or so. But we could and did collect cigarette cards, gaining thereby much information. We remember well "Curious Birds"—a series of fifty. Our experience during many years in the Gas Industry has been to receive for thought and to ponder over "Curious Reports"—a series of fifty *plus*. The majority of these reports have been excellent. To some of them the present Report of the Utilization Sub-Committee of the Post-War Planning Committee of the British Gas Federation refers, hoping, *inter alia*, that the recommendations of the Institution Committee of Enquiry on Sulphur Removal (1942) and of the Committees of Enquiry on Gas Quality and Coke Quality (also 1942) will, some time or other, be put into effect. We suppose, too, that it hopes that its own recommendations will be implemented. We also hope they will, but the Gas Industry, may, even now, true to form, pigeonhole ideas, put the traditional stopper on hopes, and file for future reference the practical, if pious, aspirations of this its latest report of a Committee's Sub-Committee—of a Sub-Committee of a Committee which is now abandoned in favour, no doubt, of a newer Committee on Post-War Planning to bring about the millennium.

Personal

The Newport (Mon.) Gas Company have invited Mr. R. J. AUCKLAND, F.C.I.S., a Director of Cardiff Gas Company, to join their Board.

At the same time the Cardiff Gas Company announce the appointment to their Board of Directors of Mr. G. M. GILL, M.Inst.C.E., M.I.Mech.E., a Director of the Newport Company.

This interchange of Directors is designed to promote co-operation between neighbouring undertakings without involving any form of financial or other integration. It is intended as a step towards bringing about regional co-ordination of a purely voluntary nature.

* * *

Mr. THOMAS CARMICHAEL, J.P., M.Inst.C.E., M.I.Mech.E., has been appointed Managing Director of the Portsmouth and Gosport Gas Company.

* * *

Mr. H. E. G. WEST, Managing Director of Newton Chambers & Company, Ltd., has been appointed also Managing Director of Thorncliffe Coal Distillation, Ltd. Recently he was appointed a Director of Yorkshire Tar Distillers, Ltd. Mr. West has lately joined the Boards of the South Yorkshire Gas Grid Company and of Hallamshire Coal Supplies, Ltd.

* * *

On the occasion of his leaving to become Assistant Engineer and Manager to Johnstone Corporation Gas Department, Mr. ANTHONY CAMPBELL, Technical Assistant at Ardrossan Gas-Works, has been presented with a packet of treasury notes from his colleagues, the gift being handed over by Mr. Robert Sturrock, Manager.

* * *

Mr. FRANCIS KERR, Assistant Manager at Johnstone Corporation Gas-Works, has been appointed to a post in the technical department of the Paisley Gas Undertaking.

* * *

Mr. JOHN G. GODWIN, of Derby, has been appointed Distribution Superintendent to the Nelson Gas Department.

* * *

A son (John Herbert) was born on Feb. 15 to Mary (*née* Marshall), wife of JOSEPH HERBERT CANNING, junior, Engineer and Manager to the Melton Mowbray Gas Light & Coke Company, Ltd., and the Uppingham Gas Light & Coke Company, Ltd.

Obituary

The death occurred on Feb. 14 of Mr. GEORGE CLARRY, in his 86th year. Mr. Clarry was appointed Secretary of the Cardiff Gas Light and Coke Company in 1885, and General Manager and Secretary in 1912—a position he occupied until his retirement in 1924. He had been a member of the Executives of the National Gas Council and the British Commercial Gas Association. He was very active in public work, particularly in connexion with the Cardiff Technical College, and he served for many years on the Education Committee of the City. He had been President of the local branch of Chartered Secretaries and of the Chamber of Trade.

He leaves two sons and a daughter, Sir Reginald Clarry, M.P. for Newport, Mon., Miss Marjorie Clarry, and Mr. Ernest Clarry, of Messrs. Alexander Comley & Co., Ltd.

* * *

The death occurred on Feb. 18 of Mr. JOHN B. ROBERTSON (74), for 60 years associated with Bathgate Gas Company, and for 47 years Manager of the Company. He joined the Company in 1883, his father, the late Mr. Robert A. Robertson, being then Manager. Thirteen years later he succeeded his father, retiring in October, 1943.

* * *

The death is announced of Mr. BRYAN BEAUMONT, of R. & A. Main, Ltd. (Large Apparatus Dept.), aged 43, after a long illness.

At the Annual Meeting of the Southern Association of Gas Engineers and Managers to be held at the Holborn Restaurant on March 21, Dr. E. V. Evans will read a Paper entitled "Target for To-morrow."

A Meeting of the Eastern District of the Southern Association of Gas Engineers and Managers will be held at 2.30 p.m. on April 5 at Gas Industry House, when Mr. W. K. Tate, M.A., Assoc.M.Inst.C.E., Hon. Sec. London Regional Gas Advisory Board, will read a Paper on "Fuel Economy Aspect in Respect of the London Undertakings."

Letters to the Editor

British Gas Association

DEAR SIR,—The anonymous and influential writer of the article on the above in your issue of Feb. 9 spends nearly two full pages criticizing the proposals for the formation of the Association, and one sixteenth page in a warm advocacy of the immediate formation of the Association irrespective of details of the necessary constitution. With this course no responsible person could agree for one moment. The British Gas Association was the tool chosen to reorganize the Gas Industry in the interests of the holding companies. There is good ground for hoping that this plan will fail and with it should go the chosen tool. The useful parts of the Association's organization could not be in operation within a reasonable time, and it is in any case obvious that the existing bodies are in a better position to carry out the work.

What the Industry wants is a thorough overhaul of the existing bodies by themselves to ensure that they are ready for their post-war work, and, especially, a strengthening of the British Gas Federation to carry out its functions as the spokesman of the Industry as a whole.

1, *Birmingham Road,* Yours faithfully,
Renfrew. W. SOMMERVILLE,
Feb. 14, 1944. Convener, Renfrew Gas Committee.

Interchange of Correspondence

DEAR SIR,—Enclosed is a copy of letter just received from Australia. Perhaps you could see your way to assist a resourceful young student by publishing the letter in your valuable journal. I feel sure that you will agree that such contacts are all to the good of the Industry.

Herne Bay Gas Company, Ltd. Yours faithfully,
Feb. 15, 1944. A. WELLS,
Engineer.

I am writing you with the hope that you will be able to connect me with a pen friend in England who is studying in the Gas Industry. I am 20 years of age, and apprenticed to Gas Engineering in my 3rd year.

If you know of anyone about the same age as myself and who would like to correspond with me, would you please give him my address.

I am very interested in the methods of gas making practised in other countries, and through an equally interested pen friend we could both glean some valuable information.

Lithgow Gas-Works, Yours faithfully,
N.S.W., Australia. (*Signed*) H. STEELE.
Nov. 11, 1943.

Exchange of Messages with American Utilities

In the "JOURNAL" of Jan. 12 we published the message which Sir Francis Joseph, Bart., K.B.E., D.L., President of the Society of British Gas Industries, sent to the President of the American Gas Association, Mr. E. R. Acker.

The following reply has been received from Mr. Acker:

"I am deeply appreciative of the kindly New Year's message radioed to me, and containing the greetings and best wishes of the Society of British Gas Industries. May I take this opportunity to extend to you and the Society the most cordial greetings and good wishes of the gas industry of America.

"It is our hope, as you well know, that this year may bring to a victorious conclusion the European phase of the war and inaugurate an era of peace in which, as you so appropriately state, 'our hearts and hands will be firmly linked together.'

"With every good wish for your continued success in the many activities with which you are affiliated."

On Feb. 7 the following cable was dispatched by Lord Falmouth, President of the Conjoint Conference of Public Utility Associations, to the Presidents of the American Gas Association, the American Water Association, and the Edison Electric Institute:

"At the Annual General Meeting of the Conjoint Conference of Public Utility Associations (of Great Britain and Northern Ireland) it was unanimously resolved that the greetings and good wishes of the Conference should be conveyed. The resolution was inspired both by the friendly relations which subsist between the two bodies, and by the knowledge that your Association in common with the Conference is not only seeking to maintain its services to the public while making the maximum contribution to the war effort, but is planning to help to implement to the full the terms of the Atlantic Charter as soon as all our enemies are vanquished."

The following replies have been received by the Conference:—

From the President of the American Gas Association:

"Kindly convey to your Associates my sincere appreciation for their resolution extending greetings and good wishes to the American Gas Association, which I am most pleased to reciprocate. We are not only allies with you in a common war effort, but we share the added distinction of being co-workers in maintaining public services vital to the winning of the war."

From the President of Edison Electric Institute:

"Thanks for your kind greetings. We have observed with pride and appreciation the heroic and effective measures taken by your members throughout the war in maintaining electric service essential for war and public morale under exceptionally trying conditions. Congratulations and best wishes."

Women's Gas Council

At a well-attended and representative meeting held in the Council Chamber at Dunfermline on Feb. 10, it was agreed to form a Branch of the Women's Gas Council, the first in Scotland.

Mrs. D. Thomson Kennedy, the wife of the Provost, presided over the meeting, which was addressed by Mrs. G. Abbott, Acting Organizing Secretary of the Women's Gas Council in London. Mrs. Abbott stressed the value of such a Council for the young women who would be coming back from the Forces and the factories. These girls would need a meeting-place where they could discuss their problems and obtain information on every aspect of homes and home-making.

It is largely owing to the enterprise of Mr. E. G. Smith, the Corporation Gas Engineer and Manager at Dunfermline, that this meeting was called.

Diary

Feb. 26.—Manchester and District Junior Gas Association, Manchester: Paper on "Benzole Recovery with Activated Carbon," by R. Walker, H. C. Applebee, and A. K. Howell.

Feb. 26.—Yorkshire Junior Gas Association: General Meeting, Rawmarsh.

Feb. 28.—B.C.G.A. Domestic Heat Services Committee: Gas Industry House, 2.30 p.m.

Feb. 29.—Association of Gas Corporations: General Purposes Committee, Gas Industry House, 2.15 p.m.

Mar. 1.—Southern Association (Eastern District): Gas Industry House, 2.30. Discussion to be opened by Mr. C. H. Chester, O.B.E.

Mar. 3.—London and Southern District Junior Gas Association: Gas Industry House.

March 14.—National Federation of Gas Coke Associations: General Committee, Gas Industry House, 10 a.m.

Mar. 21.—Southern Association: Committee, 11.30 a.m.; Luncheon, 1 p.m.; Annual General Meeting, 2.30 p.m. Holborn Restaurant, W.C. 1. Presidential Address of R. C. Taylor, M.B.E.

Mar. 25.—Western Junior Gas Association, Bristol: Paper on "High Pressure Storage and Distribution," by B. G. Hawkins.

Mar. 29.—London and Southern District Junior Gas Association: Gas Industry House.

April 5.—Southern Association (Eastern District): Gas Industry House, 2.30 p.m. Paper by W. K. Tate, M.A., Assoc. M.Inst.C.E.

At a Meeting of the Clitheroe Town Council on Feb. 16, the Mayor (Councillor G. Dewhurst) presented a grandmother clock to Mr. Harry Robinson, foreman at the gas-works, on his completion of 50 years' service in the Gas Department.

Presiding at the 55th annual meeting of the Colonial Gas Association in Melbourne, Sir Arthur Robinson said the problem of the unprofitable small consumer in country areas had been partially solved by the introduction of a tariff which ensured that each user paid for a minimum quantity of 1,000 cu.ft. of gas per month. The price of gas was not increased except where this was unavoidable, and the tariff was made uniform for all the country works in Victoria. The price of coal had been the most adverse factor in production costs. While gas revenue from 1939 to 1943 increased by 66%, the coal cost increased by 145%. Inadequacy of coal stocks had been another serious anxiety, and the position was critical.

Some Effects of sulphur on welding are discussed in the latest issue of the *Welder*, the magazine devoted to electric arc welding published by Murex Welding Processes, Ltd., Waltham Cross. It is pointed out that sulphur contents greater than 0.07% in steel can cause cracking and porosity troubles through welding. Although this can be minimized by the use of certain types of electrode and technique, the choice of high sulphur steels for welding should be avoided wherever possible.

The fact that goods made of raw materials in short supply owing to war conditions are advertised in the "Journal" should not be taken as an indication that they are necessarily available for export.

PLASTICS AND THE GAS INDUSTRY*

By A. RENFREW, Development Manager of I.C.I. (Plastics), Ltd.

THERE should be a close liaison between the Gas Industry and the plastics industry of the United Kingdom, since in both industries coal is the most important chemical raw material. The plastics industry in the United Kingdom uses other basic raw materials, but depends on imports for most of them. What the future holds is anyone's guess, but no one has yet suggested that the chemical use of coal, in the manufacture of calcium carbide, phenol, benzene, urea formaldehyde, &c., is likely to be discontinued in the near future. Indeed, all the indications point in the opposite direction, and coal as a chemical raw material is likely to increase in importance, whatever the post-war set-up. There will therefore be more and more pressure on the Gas Industry to reduce the temperature of carbonization even below that attained in the vertical retort. There is a tendency to assume that because the ultimate raw materials of plastics—coal, petroleum, air, salt, and cellulose—are cheap, plastics themselves must be cheap. This is not so, and the cost of any plastic depends on the number and complexity of the chemical steps between the raw materials and the finished article.

The definition of a vague word like "plastics" is difficult, but the attempt is probably worth while as it introduces the basic chemical and physical conceptions of the industry. The simplest plastic is polythene, built up from long chains of molecules, CH_2 groups. Most of the modern synthetic resins—"Perspex," polystyrene, saran, polyvinyl acetate, polyvinyl alcohols, and a host of others—can be regarded as derivatives of polythene formed by replacing the H atoms by other chemical groupings. These plastics are not made from polythene, but if they are regarded as derivatives the family relationship becomes clear. Polythene and all the other plastics so far mentioned are thermoplastics—*i.e.*, they soften when heated without suffering any significant chemical change—but it is possible to tie the long chains together chemically, and where this operation is carried out during shaping and moulding the plastic is said to be thermosetting—*i.e.*, the long chains are capable of being tied together so that heat has not the same softening effect on the finished product, although it may be used to forge the links.

Groups of plastics with other repeating units in the chain are known and manufactured—*e.g.*, in the nylon group the repeating unit is:

$$-HN\,(CH_2)_xNH.OC(CH_2)_yCO-.$$

It will be clear that plastics are long chain molecules built up from repeating units, generally containing carbon. If we apply plastics terminology to compounds not built up synthetically from organic chemicals, clay would be described as thermosetting and steel and glass as thermoplastic.

Some plasticizers are likely to be important outlets for coal products —*e.g.*, polyvinyl chloride compounds, of which the plasticizer content may be as high as 50%. Most thermoplastics must be mixed with plasticizers to convert them into articles of commerce, and many plasticizers—*e.g.*, tricresyl phosphate—are coal-tar derivatives. Thermosetting plastics have, however, not yet been successfully plasticized, although a similar effect has been achieved by chemical modification.

Between 1865 and about 1912 there was no important commercial production of new plastics, although many of those in common use to-day had been synthesized during the great organic chemical development of the 19th century. Dr. Baekeland made his epoch-making discovery of phenol formaldehyde about 1912, and further outstanding advances since that time have been the discovery of urea formaldehyde —a reflection of the growing demand for colour in everyday life—in 1914, polyvinyl acetate in 1917, and soon after its derivatives, many of which are still in the development stage; cellulose acetate, a non-inflammable celluloid which can be injection moulded; aniline formaldehyde; polyvinyl chloride, first made in 1833, suggested as a plastic in 1912, developed in 1935, and now an important rubber substitute in this country; polystyrene, a moulding powder developed in Germany; polymethyl methacrylate ("Perspex"), discovered almost simultaneously in Germany and the United Kingdom; polythene, which has contributed much to the cable industry; and nylon, which has received more publicity than all the others put together.

Uses of Plastics in the Gas Industry

The applications of plastics in the Gas Industry fall into three categories: their use in plants for the manufacture of gas; their use in gas distribution; and their use in gas fittings. Polythene is probably the most interesting. It is the only plastic discovered and produced only in this country. Its chemical resistance is excellent, but it is important to bear in mind that its temperature resistance is limited to about 70°C. The protection of pipelines is an obvious application, and another is the spraying of polythene powder for the protection of metal structures.

Acid-resistant cement and concrete are being made from phenol-formaldehyde resins with inorganic fillers, and techniques are being worked out for the internal lining of large tanks with polyvinyl chloride compounds. Protective clothing for workers in the Gas Industry is also of interest.

[The Author displayed at this stage a number of samples of cloths proofed with polyvinyl chloride preparations which have been used on account of their chemical resistance.]

Other applications such as hose, and gaskets, floors and floor coverings immediately suggest themselves, and a good deal of time might be devoted to discussing any one of them.

Probably one of the most interesting applications is the use of polythene and polyvinyl chloride compositions for cable insulation. This form of cable insulation from the point of view of the Gas Industry has the advantage of chemical resistance which is not shared by the rubber cables previously used.

As regards the distribution of gas, it is possible to produce rigid pipes of small and large diameter, but for the distribution of gas one needs to be absolutely certain than an accidental hard blow does not break the pipe.

There would appear to be a tremendous future for the use of plastics in gas fittings, bearing in mind the colour range it is possible to obtain. It has been suggested from time to time that gas meters may be suitably moulded in plastics, but against that it has been argued that the water resistance of phenol-formaldehyde resins is too low. It should be possible, however, by selecting the right sort of plastic to obtain a good-looking and serviceable article. It has also been suggested that automatic pressure regulators might be made from plastics. Other applications are the lining of cocks to prevent leaks due to metal wearing oval, knobs in colour, and surrounds for fires.

DISCUSSION

Mr. **Barnett** (Mid-Kent) enquired at what pressure the various plastic mouldings were made, and whether the pressure had any effect on the ductility and the strength of the materials.

Mr. **Renfrew** replied that the pressure varied from one plastic to another. For the thermosetting types the pressure was from 1–2 tons per sq.in. In extrusion processes quite low pressures could be employed, but it was difficult to calculate them. It was probably something of the order of half a ton per sq.in. In injection moulding processes pressures up to 10 tons per sq.in. were used. Those pressures did not have any significant effect on the ductility of the materials. With lower pressures the material was not moulded properly, and peculiar results arose.

Mr. **E. O. Rose** (Tottenham) said he was very interested in the uses to which plastics could be put in the Gas Industry. For some time he had been thinking of possible future uses in the way of corrosion resistance in distillation processes, and he wondered what were the prospects of having condenser tubes lined or coated with plastics. Another point the Author had not mentioned was the question of the thermal conductivity of plastics. Was there any reasonable hope that they would be cheap enough to use in the construction of condensers comprising several hundreds of sq.ft. of cooling surface?

Mr. **Renfrew** said that plastics had quite an important future in connexion with the lining of condensers to make them resistant to chemical attack so long as one bore in mind the very definite heat limitation. Most thermoplastics would not stand more than 70°C., while the thermosetting materials which would stand the higher temperatures tended to be rather brittle and to flake off. He thought polythene could be used in order to give chemical resistance to any article of plant which was not subject to temperatures greater than about 70°C. He was certain that plastics now in the development stage would meet the Gas Industry's requirements, and would be capable not only of giving a high measure of chemical resistance, but also of withstanding the fairly high temperatures obtained in the condensation processes to which Mr. Rose referred. The rate of progress in the plastics industry was so very rapid that he would be surprised if within the next five years the materials of the type he required were not freely available. Whether or not the price would be so high as to rule them out was quite another matter. It was, as he had emphasized at the beginning of his talk, rather a bugbear of the plastics industry that everybody assumed that because plastics were made from coal and air and water they must be very cheap. Plastics were very poor conductors of heat, but it was possible to increase their thermal conductivity by incorporating metals in them.

Mr. **R. P. Donnelly** (Gas Light and Coke Company) asked how internal polythene coatings compared with rubber linings in water treatment plants employing acid regeneration. He noticed that the Author had suggested that the Gas Industry should produce phenols in preference to benzole. One could say straight away that from the Gas Industry's point of view it would be a case of gaining on the swings what it lost on the roundabouts. It seemed to him that they should consider the recovery of phenol residues from concentrated liquor plants. A considerable quantity of oil was carried over into the purifiers which could be got out.

Mr. **Renfrew** said polythene had several outstanding advantages over rubber for lining chemical plant, but it was too early to claim too much for it because it had not been used commercially. It was

* From a Paper to the Southern Association of Gas Engineers and Managers Eastern District), Feb. 4.

still definitely in its early stages. It did not resist the high temperatures that rubber would stand, but it was not far off. Within its limits it was much more chemically resistant, it was resistant to water, and it did not age, and therefore it should have a longer life. For any application in contact with water he thought polythene should be preferred every time provided it was possible to get the right sort of adhesion to metal. A lot of work had been done on the adhesion of rubber, and it was to be repeated with plastics. He had no remarks to make about the relative merits of producing benzole and phenol. The plastics industry was perhaps not of any tremendous significance to the Gas Industry just now, but he thought the fact that the production of styrene in the United States had reached over 70,000 tons a year meant something. The plastics industry was bound to grow, and its importance to the Gas Industry was therefore bound to grow too.

Mr. J. H. Dyde (Uxbridge) said it was obvious that many of the unsaturated hydrocarbons were taking their place in the commercial field. He would like to mention a particular problem that he came across at Plymouth in 1928 which had a bearing on the question of the condensation of gums and resins. Like many other undertakings, they were having difficulties in the distribution system from the formation of these resins wherever they had wire-drawing on cooker thermostats or heater thermostats, and it was traced to the presence of indene and styrene going forward in the gas. Actually at Plymouth at that time they had no wash oil process for the removal of naphthalene, which, he believed, collected gum-forming bodies that existed in the liquid phase. They injected petroleum under pressure into the mains, and that had the effect of retaining the indene and styrene and other similar bodies in suspension, and then carrying them forward to where they were deposited in very awkward places. The oil containing those products separated out in the top of the meter casings. There were, however, certain products which also formed gums which existed in the vapour phase, and he was not quite sure what they were, except that they were of the ethylene derivative or unsaturated ethylene derivative type. Could the Author suggest some means of eliminating them from the gas stream so that they could not do the damage on the district? If the Gas Industry's products were going to be so very valuable to the plastics industry, was benzole going to be developed as a primary product or were they going to continue to sell it as a motor spirit? The phenols were important. They made more phenols with continuous vertical retorts than with other carbonizing plant. Was that to be just another case for using that form of carbonization as against other forms? The economics of their by-products could be discussed indefinitely while their system of gas making was their main problem. No doubt in the future they could expect a greater revenue from their tar and liquid products generally.

Mr. **Renfrew** said he was afraid he could not suggest any method of eliminating those unwanted gums which were a trouble in the circumstances described by Mr. Dyde. The ethylene products to which he himself had referred were produced by high pressure synthesis, and were therefore fundamentally different from those produced under low pressure. He would be cautious in suggesting to the Gas Industry that low temperature carbonization was a development to which it should pay more attention because he knew it was a subject that had been controversial in the Industry, but he did feel that anything that could be done to get away from the horizontal retort and move towards the continuous vertical retort would, from the point of view of the plastics industry, be a step in the right direction.

Mr. **P. Richbell** (Croydon) said one of their difficulties was corrosion of the service pipes, which consisted of wrought iron tubing. Did Mr. Renfrew think it would be possible to get their pipes coated both internally and externally, both to resist soil corrosion and corrosion from their own product? In the case of joining lengths of pipe together, presumably they could use a sleeve of polythene, and perhaps the work could be done by unskilled labour.

Mr. **Renfrew** doubted if it would be possible to protect the pipes internally and externally at the same time by dipping them in polythene, which, although it had a sharp melting-point, formed rather a viscous liquid, far too viscous to enable any dipping operation to be carried out. There would have to be two separate processes. It was a mechanical possibility, but with polythene at its present high price he was very doubtful whether it would be justified from the economic point of view. On the jointing question, it was possible to manufacture polythene sleeves to be fitted on externally, but its chemical resistance was of such a high order that there was no solvent to stick it, and the only satisfactory way was to weld it. It was very easy to weld polythene to itself to make homogeneous articles, and in the laboratory they had made small retorts and articles to contain hydrofluoric acids, all built up by the welding process.

Mr. **Macdonald** said there was one product in use in the Gas Industry that he thought would come within the Author's definition of plastics, and that was "neoprene." It used to be said that there was nothing like leather, but the very old firm of George Angus, known to most of them in the Gas Industry, were making "neoprene" articles that were exceptionally good in use in connexion with oil. They gave much better results than leather articles.

Mr. **Renfrew** said the product referred to fell into the debatable borderline between plastics and synthetic rubber, and it undoubtedly possessed a much higher oil resistance than ordinary rubber.

Mr. **S. Langford** (Robert Dempster & Sons, Ltd.) said he was interested in the question of the spraying of plastic material to resist the attacks of acids and so forth, and he wondered whether any experiments had been carried out in that direction, by which plastic material might reduce the amount of homogeneous lead lining in acid tanks made of steel. The Author had referred to the possibilities of plastic materials being used in connexion with conveyor belting. Had any experiments taken place to prove the commercial possibilities?

Mr. **Renfrew** said that with regard to the spraying of polythene there had been quite a number of experiments, and many sprayed articles were now in service, but it was yet too early to say whether or not the experiments were satisfactory, although so far as they had gone they had given complete success. He felt sure that it could replace homogeneous lead lining where the low limit of temperature resistance of polythene would not be a disadvantage. The low temperature resistance could not be stressed enough, otherwise people would use polythene for applications for which it was unsuited. Although he had said it would resist only up to 70°C. he was being quite conservative. It was possible to take an article coated with polythene and keep it in boiling water overnight, and it would appear to be unaltered. There was a small amount of work being done on the possibilities of using polyvinyl chloride plastics for conveyor belting, but it was too early to say whether it was a success or not. Unfortunately at the moment all the energies of the plastics industry were directed towards turning out more thousands of tons of material for the cable industry and everything else had to take a back seat. The sooner they could get busy on applications for conveyor belting the better it would be for the industries concerned.

Mr. **J. R. W. Alexander** (Associated Gas and Water Undertakings) said it would be unfortunate to leave the impression that they were not interested in the plastics industry by reason of the fact that its demand for the Gas Industry's products was small. They were very interested indeed in the plastics industry, both as a producer of raw material and as a user of its products. They all realized that the future of the plastics industry was virtually limitless, and one could only hope they would not be exposed to financial speculation. The Author had referred to the temperature limits of plastics, and he wanted to translate that into practical politics. Could the plastics industry offer at the moment, or was it ever likely to offer, a material which could be used in the Gas Industry, on the one hand for refrigerator casings and linings, and on the other hand for gas fire and gas cooker casings?

Mr. **Renfrew** agreed that there were possibilities of a financial ramp in the plastics industry. There was far too much of the wrong type of publicity for plastics. On the question of the use of plastics in refrigerators, he thought that was an admirable use for them, for they were undoubtedly resistant to low temperatures. They must always remember that plastics were at the moment relatively expensive and were likely to remain so, but he felt that refrigeration was a very promising field for development. At the other end of the scale he was not so hopeful about the use of plastics in gas fires or in gas fittings in close proximity to heat. If they could insulate them sufficiently from the heat they would be all right, but if there was a danger of a phenol formaldehyde plastic being used for any length of time in a temperature of over 120°C., it should be ruled out at once. There had been a number of gas fires put on the market which had been made very attractive by the fairly liberal use of plastics, and some of them had been successful while some had not. The success or failure of these decorative and utilitarian articles depended on co-operation between the manufacturer of the plastics and the designer.

Mrs. **Lovat Fraser** asked the Author for his opinion on the use of ethyl cellulose for the small square cups used for ice making in the domestic type of refrigerator.

Mr. **Renfrew** said he thought it would be quite suitable for the purpose, but at the present time there was only a small production of ethyl cellulose in this country.

Mr. **G. M. Gill** (Severn Valley), proposing a vote of thanks to the Author, said that as the Gas Industry produced materials which formed an important part of the plastics industry they were all very interested in the subject. Mr. Renfrew had referred to the possibility of their carbonizing coal at lower temperatures, but he did not think they could hold out much prospect of that possibility, because all gas engineers looked rather to high temperatures than to low ones, and he thought that would be the trend in the future as it had been in the past. As regards the use of plastic material in the Gas Industry, he recalled having seen in a meter works in America some years ago some gas valves made of plastics. He was interested at that time, but he did not know to what extent it had been developed since. As to gas meters, he did not suppose anyone liked the appearance of them, and if they could use plastics, both to improve their outward appearance and to make the valves and the various inner parts of the meter, it would be a very great advantage.

Mr. **G. L. Braidwood** (Gas Light and Coke Company), in seconding the vote of thanks, said Mr. Renfrew had done extremely well in explaining a highly technical process in terms which they could all understand. There was one point he hardly liked to raise because it might seem too far afield, but one thing one had been watching for was a form of paint that would resist atmospheric corrosion, to say nothing of the smaller bulk of material which had to stand up to chemical corrosion. He did not suppose the Author could say whether plastics could be produced in such vast bulk that the possibility of doing so was an economic proposal.

Mr. **Renfrew** briefly returned thanks.

AIDS TO PURIFICATION

The following is a report of the discussion on the Paper by Mr. C. Cooper to the Manchester and District Junior Gas Association—see "JOURNAL" of Feb. 2.

The President (Mr. **H. H. Thomas**) said that Mr. Cooper had mentioned the complexity of the oxide purification process, but apparently this complexity was brought about by the almost infinite variety of rules upon which the capacity of purifiers was based. A process which was approximately defined could, in his opinion, never be anything but a difficult baby to nurse.

Mr. **J. Albinson** (Partington) cited a considerable number of crude gas constituents other than those mentioned by the Author, which could be considered as contributing to the complexity, and pointed out that in the oxide mass there were, besides oxide of iron, quantities of water, of sawdust and turf, and other material. The operation of the purification process under these conditions was something of a marvel of nature. He further observed that in systems of liquid purification, it should not be taken for granted that the factor of complexity would not arise, although he admitted that one complication might be omitted—that was, the addition of oxygen. This he considered the main, possibly the only advantage. He further suggested that the cost of pumping operations in liquid purification might even be prohibitive as compared with efficient methods of handling oxide in and out of the boxes. One of the reasons why the oxide system worked so well was because the mass of reactive material was so large compared with any conceivable rate of sulphur admission that uniform results might well be looked for. In liquid purification, on the contrary, such advantageous conditions could not be provided. On the other hand, the matter of the outlet for spent oxide after the war depended on national policy and on world policy and not on domestic policy. There was considerable scope for the use of spent oxide in making acids, as much more acid was being made than could be produced from spent oxide. In regard to the so-called valuable by-products, to whom were they valuable? The prices obtained for them did not suggest they were valuable to the Industry or to the community generally, and this indicated a policy for producing purer products.

Mr. **R. Walker** (Manchester) referred particularly to the comparative cost of detarring by the electrical precipitation method as compared with the older method. He confirmed that Mr. Cooper's figures were conservative, in that it was possible to show the cost of P. & A. practice was increased by the necessary periodic cleaning. He suggested about £50 per annum for this item alone. With regard to the economics of electrical precipitation as affecting the oxide process, he had not been able to go into the question, but he expected that others present would have more definite information, and that the Manchester Oxide Company would have valuable data on this point. The detarring system gave less trouble, was definitely reliable, had a high degree of efficiency, and in his opinion was the right practice to adopt. With regard to the question of humidity in gas purification, he pointed out that the term "dry purification" was a misnomer. The purification process only went on where there was moisture.

With regard to the relative costs of working a liquid purification as compared with a dry purification process, he suggested this was something that could be specifically investigated and he wondered whether there could be established the cost of working a moving condition of the oxide bed in purification. The suggestion was that it was possible to move the oxide mass by water as a vehicle, and he stated that work was being done in that respect.

He did not consider it essential to assume that a liquid purification system was not capable of 100% removal, because he had evidence to the contrary. The cost of handling oxide was now 300% more than the pre-war rate, and therefore the whole question of alternative means of purification was a very live one. He expected that there would be continuous difficulty of this kind after the war.

He was interested to know that work was going on by Mr. Cooper and his firm on the use of ammonia in procuring purification, and suggested that ammonia was vital not only in the fouling but in the revivification stage. The oxidation reaction tended to lag behind the sulphiding so that the rate of oxidation required accelerating as compared with sulphiding, otherwise there could not be continuity of the liquid purification condition.

Referring to the future of by-products, they should have in mind the enormous amount of research work which was being carried on by the oil interests on large scale plant. They were marketing products of 100% purity, and the buyer was not involved in the question of rectification, &c. However, even with the limitations imposed on the Gas Industry, there was no reason why there should not be simplification of method and a removal of some of the compounds to which Mr. Albinson had referred, so as to obtain greater simplicity and better purification, tending to a higher value of the by-products.

Mr. **Lewis** (Salford) remarked that the question of liquid purification had been studied by the Institution's research staff, with a generally unfavourable verdict, from the economic point of view. If, however, the Gas Industry had, with all its years of experience, been going on wrong lines, how could the management of gas undertakings, in view of the vast amount of capital expenditure involved, consider scrapping present methods? It was a different matter where new works were being erected, but few gas engineers would have the opportunity of building new works. There were satisfactory systems of operation of purifier installations based on experience and on technical information; nevertheless, at the present time gas engineers were being asked to consider something that was not necessarily less complex.

In considering the post-war position, they could only expect a further decline in ammonia values, and the various methods of disposal, including rejection to the drain, did little more than meet a possible loss. A certain amount of profit was shown, but it was only as a sideline. Concentration of the ammonia was being carried out on controlled prices, but they would probably only prevail during the war period, and the buyer would be in a position to refuse to pay such prices later. It was a matter for the Gas Industry as a whole to consider, and particularly the capital that had been invested in concentrated liquor plants.

Regarding sulphate of ammonia recovery, it appeared that the strength of liquor produced in the works was a fundamental consideration. It was possible to remove all the ammonia without the introduction of extraneous water.

He further referred to the work done by Dr. Key in his report to the Institution, wherein ammonia recovery was discussed. He mentioned the possibility of tapping off liquor from the retort circulation containing chloride and the possibility of recovering chloride in practically the pure condition. Dealing with the electrical detarrer, he was aware of cases where the tar in oxide had been reduced to a very low figure by sufficient precipitation, and expected this would show a saving in purification cost.

Gas heaters in cases with which he was acquainted had been shut off entirely, because it had been found more beneficial to introduce steam direct to the boxes. He did not necessarily agree, however, with Mr. Cooper that the gas heater did not warrant the capital investment.

The Author had mentioned the advisability of producing improved by-products, and he pointed out that sulphate of ammonia was even now a practically pure product. He recommended, however, attention to the improvement of the by-products made for sale, and that they should not rely on their purchasers to carry out operations which could be dealt with by the Industry itself.

Mr. **H. B. Taylor** (U.K.) said it would be attractive if some pretreatment would allow existing purifiers to cope with more gas, but, assuming that a reduction in the sulphur content of the gas entering the boxes was effected, how would Mr. Cooper suggest that the boxes should be kept reactive? He had always understood it was more difficult to eliminate the last trace of any impurity rather than deal with the mass, and if the new process Mr. Cooper had mentioned were in operation, would it be possible to modify existing boxes so as to enable them to deal with these conditions?

Mr. **H. G. Cooper** (Manchester) said that the Author had previously stated a cost of detarring as 0.1d. per 1,000 cu.ft. and would like to have confirmation. He quoted a tar content in a Manchester purification plant of 1.1%. He suggested that if as much as 90% of the sulphur was removed from the gas, there would still be required at least 75% of the present box capacity at present in use.

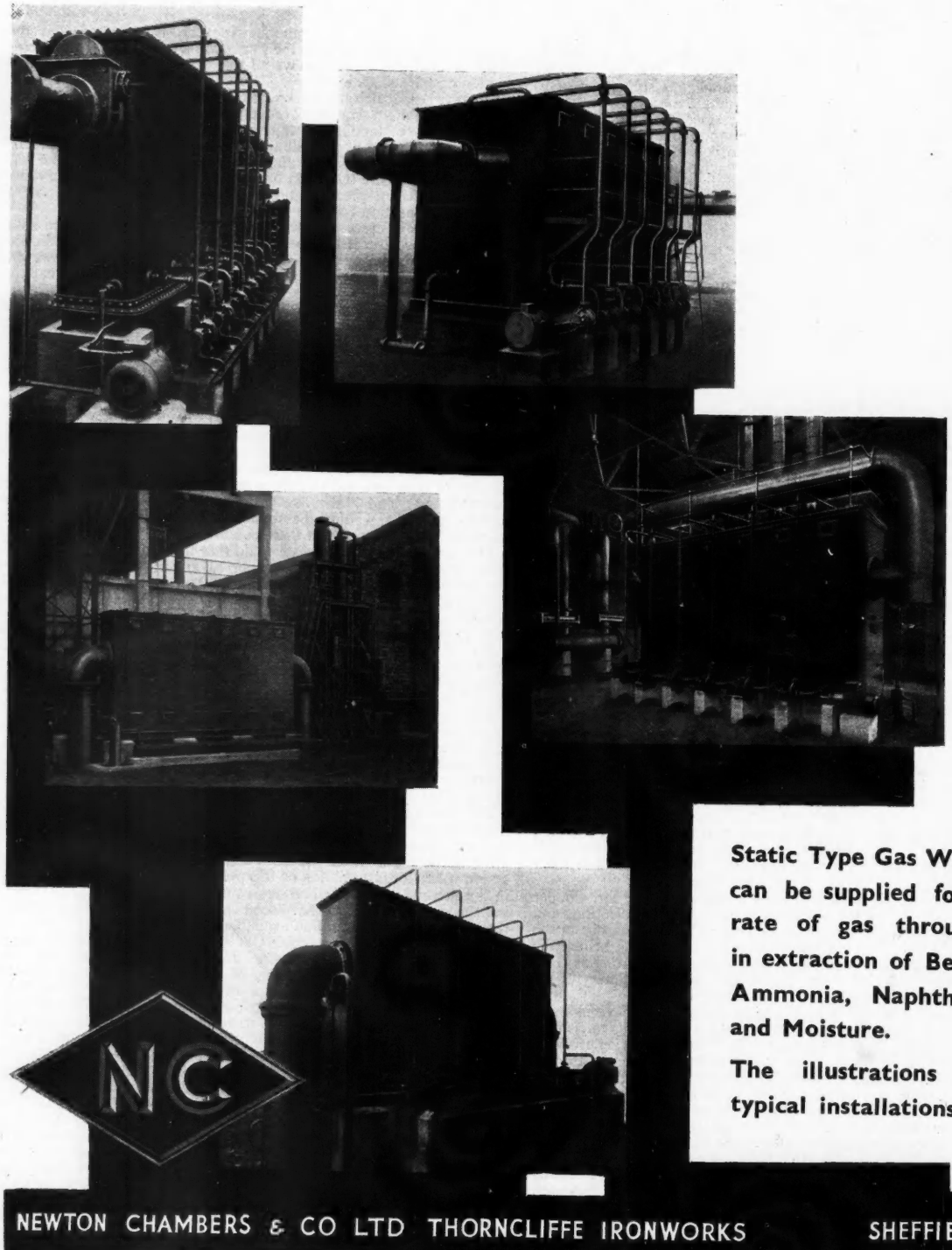
Mr. **A. Ormrod** (Liverpool) observed that the Gas Industry would probably reach a solution of its difficulties more quickly if it entertained a more enlightened view as to what chemists as a profession could do for the Industry. He enquired whether the system of gas heaters suggested by Mr. Cooper in second and other positions might be explained. He also expressed interest in the suggestion that the water admission to ammonia washers could be automatically controlled. The Author had observed that if a heater were built into each box it could be rotated with the box, and that was the way in which the successive heaters had been provided.

Dr. **M. Barash** (Ministry of Fuel and Power) said that there had been references to the town gas standard of H_2S removal, and Mr. Walker had mentioned 100% H_2S removal. There did not seem to be any point in the Paper where the exact degree of removal was mentioned, and he asked for information on this point. He had noticed references in the literature to vertical towers using balls or briquettes of oxide, but this did not appear to have been carried out in this country. Was there any further information available on this subject?

Mr. **H. B. Avery** (Manchester Oxide Company) thought the word "complexity" had been used rather freely in the discussion, and he suggested that, although the theory of purification might be complex, it seldom became a serious factor in the practical work. He had studied the heating of successive boxes, and had found that more heat was evolved from following boxes than might be expected, suggesting that oxidation was taking place with heat evolution. A great part of the oxidation, however, did take place in the first box, and this was one of the reasons for its high evolution of heat. In discussing the question of mechanical handling of oxide, he would ask them to note that in many cases it would probably be discovered on examination that every bit of the spent and of the free oxide was actually dealt with by hand in one way or another. He further suggested that where a number of sets of boxes were involved, on one works, and an experienced gang was fully employed, the oxide treatment of the gas would probably still show itself to be the cheapest way of dealing with H_2S.

Mr. **D. M. Henshaw** (W. C. Holmes & Company, Ltd.) said he had been in close touch with many of the matters discussed by reason of his membership of the Gas Research Board, and he had been impressed by the general realization of the need for more research work being

STATIC TYPE GAS WASHERS



Static Type Gas Washers can be supplied for any rate of gas throughput in extraction of Benzole, Ammonia, Naphthalene, and Moisture.

The illustrations show typical installations.

NEWTON CHAMBERS & CO LTD THORNCLIFFE IRONWORKS SHEFFIELD

undertaken to facilitate the progress of the Industry. He was interested in Mr. Walker's contribution to the discussion, and was pleased to note that some useful research work on the important question of liquid purification had been initiated by Mr. Walker and his colleagues in Manchester.

Mr. **R. H. Clayton** (Manchester Oxide Company) referred to the work of Feld, and stated that the Koppers Company spent a great deal of money on the development of liquid purification without producing any success. He hoped that Mr. Walker would be more successful. He confirmed that in the oxide purification process Mr. Albinson's observation was perfectly correct—that was, there was so much mass in the boxes to deal with so little input. He further drew attention to the fact that the purification of gas in oxide boxes did not actually cost much, and the cost of chemical control on a liquid purification process must be contrasted with that of ordinary labour wages.

Mr. **Cooper** remarked that for the sake of simplicity he had deliberately omitted a number of the complicating constituents mentioned by Mr. Albinson. He did not quite agree with Mr. Albinson that the cost of oxide purification would not provide sufficient power for pumping in the liquid purification process, but thought it would go a very long way. He confirmed that the reserve of oxide mass which had been mentioned was a great help to the oxide process, but it should be considered that there was a possibility of conferring similar advantages on a liquid purification process. It would not necessarily appear, of course, on an experimental plant. He thanked Mr. Walker for his additional observations on the cost of operating P. & A. tar extractors, but he would not care to generalize on the cost of cleaning, because much depended on the character of the tar being handled, although he agreed that Mr. Walker's figures helped the argument considerably. Evidence of the improved quality of spent oxide in works with precipitators was not easy to obtain, because, in the first place, it took a long time to turn over the whole of the oxide in the works, and many people had not worked their precipitators for more than a short time. There was, however, evidence gradually accumulating that considerable differences might be expected in time.

On the general subject of liquid purification, he accepted Mr. Walker's observation that failure to purify to the Gas Referee's standard was not invariable. He further mentioned that possibly liquid purification processes would be more sensitive to conditions such as temperature than would oxide purification.

In discussing Mr. Lewis's remarks, he said it was possible the official attitude to liquid purification might change with the labour position in the future. He would not say that liquid purification was good for any particular set of circumstances necessarily, but in regard to the use of ammonia it was mentioned in the Paper that the process carried out a double duty, because besides purification it produced a non-crystallizing concentrated liquor.

He confirmed the idea that the proper treatment for liquor to be used in an ammonia washer was to make it right before it entered the washer, because bad results would follow the indiscriminate use of liquor of unsuitable character. He also agreed with Mr. Lewis's remarks on the subject of sulphate manufacture and on the possible recovery of chloride, which had been proved profitable in more than one instance.

Dealing with the question as to whether a gas of low sulphur content could be successfully purified, he referred to the fact that where clean coal was carbonized in coke ovens, the inlet sulphur might be as low as 250 grains, and quite a considerable quantity of gas with only 300 grains was already under treatment. This suggested that perhaps 200 grains was a workable limit, and he did not see that, under stimulus, oxide could not be successfully worked at 200 grains, whereby the labour problem would be reduced in that proportion. It would not, however, be safe to say whether enrichment to 50% could be obtained definitely.

A question had been asked whether tar fog could be expected to go through a final washer. He was not surprised at this observation, because it had been proved to go through the oil scrubbers in a coke oven plant.

He promised Mr. Ormrod that more information would be available concerning the ammonia controller in a short time.

In regard to the question raised by Dr. Barash of the actual degree of purity of town gas, he referred to some work published by Dr. Hollings and Mr. Hutchison in 1935. The figure given there was 1.5 part per million by volume, or 0.05 grain per 100 cu.ft., as representing the sensitivity of the lead paper test. The purity actually obtained in practice was considerably higher than this. Of the original H_2S in the gas, the purification process should not leave more than 1 part in 100,000.

He also thanked Mr. Avery, Mr. Clayton, and Mr. Henshaw for their observations, and briefly replied to each.

Mr. **J. C. Hogg** (Stretford) moved a vote of thanks to Mr. Cooper for his Paper, in the course of which he confirmed a considerable improvement in the condition of oxide after installing an electrical detarring plant. He quoted cases where boxes had had to be removed from circuits, not on account of the oxide being spent, but entirely owing to tar fog, and they had eliminated this trouble. Their spent oxide generally finished up in an agreed test of 0.5% tar, but much of this was not tar fog but other constituents drawn from the gas. He further expressed interest in the method of controlling the feed to ammonia washers, and referred to certain difficulties they had had in this direction.

Mr. **D. Benson** (Bolton) seconded the vote of thanks, and described briefly some laboratory experiments he had undertaken some years before on the use of caustic ammonia for the removal of H_2S. Their experiments had gone so far as to remove also the CO_2 and a portion of the sulphur compounds other than H_2S. He considered that the removal of CO_2 was desirable because of the possibility of substituting an inert by water gas. The elimination of the CO_2 also had an effect on corrosion.

PURIFICATION*

By H. B. AVERY

(*Continued from p. 212*)

This ensures the concentration of reactions in the first and second takers, and although it has been proved that when the oxide is new or only partly spent a high proportion of the available oxygen is absorbed in the first box, that is during the sulphiding operation, an appreciable amount of available oxygen still remains to be absorbed in the second and subsequent takers. Where the temperature of the gas entering the second taker is fairly high owing to major activity in the first box, the rate of oxygen absorption in the second box is accelerated. Another factor in favour of this system of rotation is that as the box moves backwards in relation to the gas stream, it is gradually cooling down, and residual oxygen having performed its functions in the third and fourth taker position, the oxide in the fourth taker is both cool and well oxidized. This point is of importance when a highly active oxide is employed, as the spent or partly spent oxide can be discharged from a box in this fourth position in a cool and well oxidized condition, so that the risk of firing is minimized. If the material be discharged from the first taker position, that is in a warm sulphided condition, firing is very liable to occur, both during emptying or on standing, particularly if the oxide is left in a heap for even a short time.

Forward rotation of four or more boxes, in which the oxide flows in relation to the gas stream in counter-current direction, is seldom practised, although a modification of this system, generally used where centre valves are employed, and generally known as the 3 on 1 off system, is still in quite common use. This system generally involves more handling charges than backward rotation, where the time-content factor of the gas and oxide is the same. The reason for this is that every time a change is made a box is emptied, the new box progressing from third to second, and then to first taker position, and when a further change is made this box is emptied and refilled. It does not appear to be generally recognized that even with the limitations imposed by centre valve construction it is still possible to work rotation in a set of this description. To do this, advantage is taken of the fact that oxide which is normally rejected as fully fouled is still capable of absorbing some sulphuretted hydrogen. Therefore, instead of discharging the box from the first taker position, as is the normal practice, this box can be cut out of line and the new box introduced in the usual way. The box should not be vented, but should be left under gas pressure. At the end of a period of, say, six hours, the gas remaining in the box will be found to be clear or substantially clear of sulphuretted hydrogen, and can again be introduced on the next rotation as third taker. This method of working avoids a considerable amount of discharging of oxide from the boxes, and gives a true forward rotation. Again, it is possible to work a set of this type in backward rotation, still working the system of 3 on and 1 off. To do this the centre valve, instead of being moved forward through one position, can be either moved backwards one position or moved forward three positions. Either method of valve manipulation will give backward rotation with one box out of line all the time. During the changes there is a slight risk of a small amount of dirty gas being swept forward, so that this is a case where a catch box can be helpful if one is already installed.

The admission of air should be provided for at the purifiers and not earlier in the operations. As this air must be introduced under pressure it is recommended that connexions should be made so that either the whole or part of the added air can be directed into any box or into the main stream at the inlet to the set. The quantity of air admitted should be measured, and is best controlled by the air booster being gear-driven from the exhauster, so that the proportion of air and gas remains constant. The gas at the inlet to the purifiers should be only slightly above atmospheric temperature; the content of ammonia not more than 5 grains per 100 cu.ft., and the tar content reduced as far as possible. If the ammonia content is in excess of this figure many troubles are likely to arise, and as high ammonia

* Paper to the Scottish Junior Gas Association.

may be the result of the ammonia washing plant being of too low a capacity for increased gas make, a further reduction may be effected by the introduction of fine sprays into the main as it runs to the purifiers, the resulting excess liquor of very low ammonia concentration being run, if possible, to waste. This operation also ensures that the gas is fully saturated when reaching the boxes. In the unlikely circumstances of excessive tar content being present at this point a substantial reduction in the quantity may be effected by the use of a small ring packed tower or apparatus packed with wood wool installed at the purifier inlet. Both have been used with some success and have the advantage of being low in first cost.

The apparatus for purification having been briefly reviewed, it now remains to consider the material employed to carry out the purification reactions. Oxide of iron, or, rather, hydrate of iron, reacts with sulphuretted hydrogen to form either ferrous or ferric sulphides, which again oxidize either with the oxygen present in the gas or atmospheric oxygen, depositing sulphur and water, with re-formation of the hydrate. This reaction can be regarded as one in which the iron acts as a medium, promoting the reaction between sulphuretted hydrogen and oxygen, yielding water and sulphur. It is possible, indeed probable, that the deposition of sulphur occurs simultaneously from other causes. It is known, for instance, that if gas containing sulphuretted hydrogen is allowed to stand in contact with water, the sulphuretted hydrogen concentration is rapidly reduced with formation of sulphur. With a very large surface exposed to the gas a further surface oxidation of the sulphuretted hydrogen also probably takes place. It is probable, therefore, that these three reactions are taking place simultaneously, and that an appreciable amount of oxidation of the sulphuretted hydrogen takes place, without the reaction between the iron hydroxide and sulphuretted hydrogen occurring. This would be particularly true where revivification *in situ* is fairly complete and where the oxygen content of the gas is high. It also offers an explanation for the continued working of an oxide, even in an acid condition, although, as previously pointed out, its activity is reduced.

Oxides generally used for the purpose of purification are: Natural oxides, artificial oxides, and recovered oxide. Natural oxides consist mainly of iron hydroxides deposited in the mouth of large rivers, examples being the well-known Dutch and Belgian ores. Other forms of oxide are weathered deposits, such as are found in Northamptonshire and Oxfordshire. Artificial oxides may be either chemical by-products produced by the precipitation of iron liquors, or, particularly at the present time, those derived from pickling and washing processes. Other types of material are burnt oxide, a product resulting from the burning of spent oxide for the production of sulphuric acid, and the oxide produced in the manufature of aluminium from bauxite. The best known representative of this last mentioned class is the German product, "Lux," produced by the decomposition of sodium ferrite after fusion of the bauxite with alkali. In a recent paper read by McLeish and published in the "GAS JOURNAL," Jan. 12 and 19, 1944, it has been pointed out that it is possible to improve the activity of a dehydrated oxide by partial conversion into an active cubic form by converting part of the iron into sodium ferrite, which is subsequently decomposed. A third class of recovered oxide is represented by the process in which spent oxide is treated for the recovery of sulphur by extraction with an organic solvent, followed by further treatment of the extracted oxide for the removal of ferrocyanides, sulphocyanides, and other soluble salts. As in these operations it is necessary to maintain a very open and porous structure, the resulting oxide possesses a structure which offers the minimum resistance to gas flow. It is, however, low in iron and high in moisture, so that to produce from this a purification oxide in suitable condition for immediate use it is fortified with a mixture of by-product hydrate to increase the iron content and with dry lightening material to decrease the moisture.

The gas engineer has to decide which class of material is most satisfactory for the particular conditions ruling at his works.

In Scotland, at any rate, it is unnecessary to comment on the natural oxides, the use of which has been so popular. One point which might be mentioned, however, is the moisture content of these natural oxides, which may be, and unfortunately often is, very high, necessitating either storing for a fairly prolonged period in order to allow a reduction of this moisture content to take place, or mixing with spent or partly spent oxide—an operation which involves labour and is not easy to perform. If the material is placed in the boxes with a somewhat high moisture content, high resistance to gas flow may be encountered. With regard to the second type of oxides—namely, those represented by the Northamptonshire or Oxfordshire ores—these are unfortunately not of such a high activity as might be expected, and are only reasonably efficient when very fully weathered. With regard to artificial oxides, burnt oxides from the by-products of sulphuric acid manufacture are dehydrated oxides, and on this account, as they only hydrate very slowly, the activity is generally low. They also require lightening and alkalizing in order to minimize the back-pressure and neutralize acidity. The materials produced from bauxite manufacture behave in a very different manner. The residue produced in the English process has, owing to its lack of activity, not proved successful for gas purification. The German product, on the other hand, produced as it is by a different process, is extremely active and in many cases too active, resulting in the production of a very fiery material, which is liable to serious overheating when in a partly spent condition, and particularly when exposed to the atmosphere immediately on and after removal from the box and containing a high proportion of iron sulphide.

Oxide of the third category can be produced in a condition of controlled activity. It originates from oxide which has already passed through the purification cycle, and has thus proved itself to be of good working properties. As the condition of the material has to be under close supervision during the various stages of extraction and final preparation, accurate control of its condition is possible, as is the final adjustment of activity and moisture content. It is thus possible to produce a standard material capable of working under a wide range of varying conditions, offering a low resistance to the flow of gas, and containing the requisite amount of moisture to act as a balancing factor in controlling the reactions.

The function of moisture in oxide has been discussed at some length in a previous paper and needs no further amplification.

In making a choice of oxide suitable for any given condition the following points should be taken into consideration: First cost of the new material, handling costs, and the sales value of the material produced. The initial cost of the oxide selected must, quite naturally, be a point of importance, but at the same time a saving effected by the use of a cheaper or less active oxide may be more than offset by inactivity or increase in back-pressure, both of which result in the oxide having to be discharged from the box, very often at inconvenient times and resulting in the production of a material of which the sulphur content is low and the sales value thereby reduced. At such times, as the present the labour involved in emptying and filling the boxes is of vital importance, and the ideal oxide for use is one which, in addition to possessing high activity and porosity, is capable, when spent, of being readily discharged from the boxes with the minimum of labour. Activity of the oxide is of considerable importance, particularly where conditions permit revivification *in situ* to be carried out to the fullest possible extent, as an active oxide is almost certain to produce spent oxide of high sulphur content with at least one handling less than a more inactive material.

A high porosity of the oxide helps in this direction by permitting the oxide to remain longer in the box before increasing back-pressure necessitates its removal, and with a sufficiently porous oxide although appreciable hardening will take place, owing to deposition of the sulphur, this hardening does not necessarily cause greatly increased back-pressure, although such hardening has to be considered in relationship to the time and labour spent in discharging the oxide. Under suitable conditions an active porous material can reach 50% or even higher sulphur content without being removed from the boxes, demonstrating that up to the end of its useful working life activity has been maintained without undue back-pressure being created. Oxide so produced is, however, hard, and in a single deep layer presents problems in the discharge of the spent material. On this account some engineers prefer the use of multiple layers, with the object of facilitating the discharge of the oxide in spite of the difficulty of filling new material into the boxes. Where layers of 10 in. or 1 ft. in thickness at the most are used it is easier to remove the oxide than when a deeper layer is employed. In the case of multiple layers it is clearly desirable that each layer should be uniform and well levelled to avoid any preferential gas flow, which may leave large portions of the oxide substantially unaffected. One necessity for these conditions is that the grids shall be in good condition, not damaged nor distorted. In many sets of purifiers the strain on the individual grids is far too great for the thickness and span, with the result that under load, particularly as warm steamy conditions exist, the grids distort, and it is thereafter impossible to obtain a uniform thickness of layer. Any lack of uniformity is much more serious in the case of multiple layers than where a single deep layer is employed.

The object of ideal purification is the total removal of sulphuretted hydrogen with adequate safety and comfort. In order to achieve this end it is necessary to keep a record of the working of the oxide, as only by this means can the time at which a box should be discharged be determined with the necessary margin of safety. Delaying the discharge of a box until the set of purifiers is on the point of passing dirty gas is haphazard, and results in a hurried changing of not only one but possibly two boxes at times when this operation is inconvenient.

Having thus briefly considered purification as an integral part of the whole series of operations covering the production of town gas from coal, we may, with advantage, proceed to the consideration of ideal purification conditions. These, it will be understood, cannot always be achieved if local conditions do not favour their application. The writer favours the old-fashioned type of rectangular cast-iron box with dry covers, with the top of the box at ground level and a well drained pipe and valve trench at one side. The boxes should be of such a size that for every 30 cu.ft. of gas per hour passed at maximum load through the set each box contains 1 cu.ft. of oxide. The boxes should be five in number and all rotated in turn with backward rotation. The oxide should be distributed in layers of approximately one foot in thickness in order to facilitate discharge. The bottoms of all boxes should be furnished inside with a substantial layer of good concrete, and facilities should be provided for continuous drain-down of condensate, care being taken to inspect these discharge points at regular intervals to ensure that the liquor is running away from the boxes. The boxes should, if possible, be under a roof, as should the revivifying floor placed at the side of the set. Discharging of the oxide should be carried out by means of a transportable conveyor, the

harging end of which could be lowered into the boxes when discharging pent oxide, the conveyor being reversed for refilling with new material. The oxide as discharged from the fourth taker position should be spread to a depth of not exceeding two feet over the revivifying floor for completion of the oxidation process. If a further exposure be required after oxidation the oxide should be passed through a breaker and damped with a finely divided spray of water. The inlet to the purifiers should be provided with live steam to assist in maintaining the temperature, if necessary, and at the same time the moisture content of the oxide.

Dry heating of the gas alone frequently fails owing to the low specific heat of the gas and the small number of heat units thus carried forward into the oxide. Downward flow of gas through the boxes is advisable, and although it remains a matter of individual preference, the provision of reverse valves so that the gas flow can be alternated between upward and downward flow does not seem fully justified. Where two sets of boxes are in use and the gas stream is split between these two sets it is advisable to work one more intensively than the other, and this set will work actively owing to the temperature developed. The other set, working on a smaller make, will be kept in a better working condition than if no gas were being passed through, and is therefore capable of acting as a reserve and taking a greatly increased load at any time. When it becomes necessary to discharge a box the volume of flow can be reversed, and the set which formerly took the lesser quantity of gas can then take the major quantity, allowing the depleted set to be relieved during the period of discharge. In order to obtain the best results from this method of working and also to enable the records of purification to be complete it is necessary to note with reasonable accuracy the flow of gas through each set, and for this reason the provision of flow meters is strongly recommended. It is admitted that this form of layout of the purifiers presupposes adequate space being available. Unfortunately, this is not always the case, and where space is restricted other forms of layout will have to be employed.

Some points with regard to the condition of the oxide at various stages of the purification operation should be considered. Moisture, as previously pointed out, is of great importance, and care should always be taken that an adequate moisture content is present in the oxide when introduced into the box, and that the requisite moisture content is maintained during the whole operational period. Oxide which has become dry and inactive is only wetted with difficulty, and it is for this reason that the admission of live steam in controlled quantities can be of such assistance. Control of the quantity of steam to be admitted is best effected through a standard jet, the orifice in which is large enough to pass the required amount of steam at the pressure available. It is somewhat difficult to determine the exact amount of steam required as this is influenced by the radiation losses, but the size of orifice necessary to fulfil the requirements may be calculated theoretically by using Napier's formula or by trial. The approximate size of jet suitable for a box containing 100 tons of oxide would be in the neighbourhood of 1/16 of an inch diameter, using steam at 40 lb. pressure. This size might have to be considerably increased if excessive condensation takes place. Regulation of the necessary amount of steam by direct valve control is unsatisfactory and erratic, but control by means of a standardized jet is positive, particularly if the jet is inspected at regular intervals.

Oxide may also fail in activity due to the development of acidity, and where two or more exposures are made the oxide should always be tested for acidity before replacing in the purifier. If an acid condition has developed this is best neutralized by the use of finely powdered lime when the oxide is broken for replacement, and it is desirable to have a slight caustic alkalinity of approximately 0·5%.

In this Paper a brief attempt has been made to indicate points which should be considered in designing and working purifiers under varying conditions, and although the material is not new, it is hoped that this method of presentation will in itself be helpful.

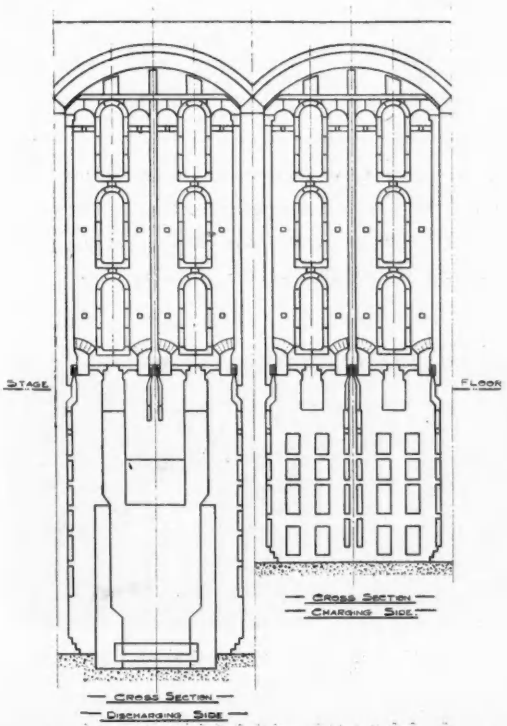
"RECTANGULAR" HORIZONTALS

Recently Mr. Muir Wilson, of the South Metropolitan Gas Company gave a Paper to the London Juniors on "Furnace Design," in which he had a good deal to say on the design of horizontal retort settings. A substantial abstract of the Paper and a report of the discussion have been published in the "JOURNAL," and we were struck with his remarks ("JOURNAL" of Jan. 26, p. 115) to the effect that, from a carbonizing point of view, it would be far better to turn the retorts in a horizontal system so that the major axis was in the vertical position. This, he said, would give much more throughput, because the rate of carbonization was roughly inversely proportional to the distance the heat had to travel.

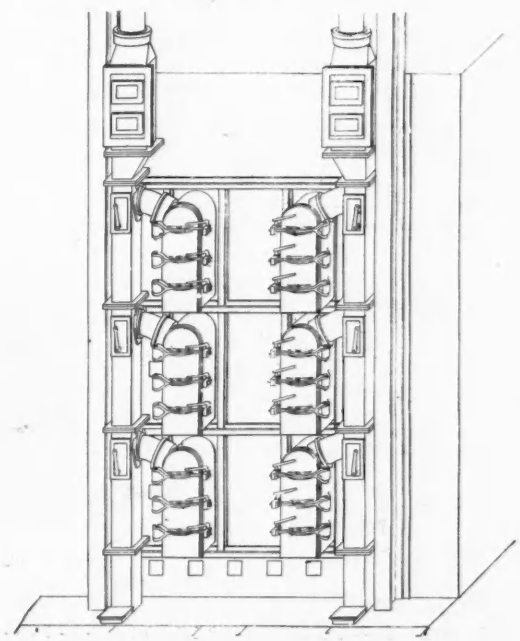
Actually Messrs. Drakes, Ltd., have, over the past few years, given considerable attention to this aspect of the design of horizontal settings, and Mr. M. T. Thompson, the Managing Director, has given us his views on the matter, which we are glad to publish.

Some years ago, he informs us, his firm realized that the ordinary horizontal retort system required modernizing and bringing up to date, and that in their opinion, to meet present-day requirements, the retorts were of wrong section, the method of heating left much room for improvement, the sensible heat in the waste gases could be better employed for steam raising than being returned to the setting, the tendency towards lower quality of coal gas should be met by steaming, and, generally speaking, the whole system needed re-designing.

So the firm decided how these new ideas could be met. However, before they installed a plant, they felt it more desirable to test out rectangular-shaped retorts, with a view to proving their stability,



Cross-section of discharging and charging sides of installation of Drakes' system of parallel heating with rectangular retort.



General arrangement of mountings of rectangular retort setting.

For every size of works and every class of coal...

WEST'S

CARBONIZING PLANTS

GLOVER-WEST VERTICALS

WESTVERTICAL CHAMBERS

440 carbonizing plants have been built or are under construction by West's in 24 countries. Working results from a wide variety of gas coals have established the high efficiency and adaptability of the West systems.

WEST'S

GAS IMPROVEMENT CO · LTD ·

MILES PLATTING MANCHESTER 10

TELEPHONE—COLLYHURST 2961-2-3-4-5 TELEGRAMS—STOKER MANCHESTER

LONDON OFFICE: COLUMBIA HOUSE, ALDWYCH, W.C.2 TELEPHONE: HOLBORN 4108-9 TELEGRAMS: WESGASCO ESTRAND

durability, and also to feel assured that they could satisfactorily charge and discharge them.

The firm obtained the permission of Mr. F. N. Booth, Engineer and Manager of the Keighley Gas Undertaking, to install two rectangular retorts, built up in segments 39 in. by 15 in., 23 ft. long. These took the place in a setting of 10 of the four top retorts, and were heated in the ordinary way. After subjecting them to very severe tests, even amounting to abuse, they were perfectly satisfied that this section was more serviceable than the present large section ⌂ retorts.

Messrs. Drakes then made arrangements with Mr. Booth to let them have two arches containing regenerator furnaces, and settings of 10, in which they built their new system, for which they have a patent (No. 518121).

The depth from the stage floor to the subway floor was not sufficient to allow installation of a full depth producer; the reservoir for cold coke was not great enough to hold any quantity, which meant that the fires had to be filled up every two hours. Semi-generators were installed which passed sufficient heat to the secondary air to support combustion, thus leaving the waste gases to go forward at a high temperature for steam production.

Combustion chamber gases are passed at equal temperatures up both sides of the retorts. They are dealt with in such a manner that the temperatures are uniform, and positive proof of this is indicated when the coke is being discharged. There is a definite vertical cleavage down the centre of the retorts, and as the coke is discharged it opens out like the leaves of a book as it falls into the chute to the conveyor, and, to anyone interested in carbonization, it is a fascinating picture.

The retorts are 39 in. by 13½ in. section in these two settings, and half were built with John Morton's fireclay blocks, the other half being Meltham silica blocks. Both materials, Mr. Thompson tells us, have done exceedingly well, and after three years' work under varying conditions are quite good. In fact, the silica retorts are still in splendid condition. The charge lends itself admirably to steaming purposes. The average throughput on six retorts was 20 tons per day.

There was at no time any trouble with the pipes, which were re-used from the existing beds. Neither was any difficulty experienced in sealing the mouthpieces. The stoking machine dealt easily with both the charging and discharging operations. The men liked the plant, as they found their task was much lighter

This system connected with Congdon pipes and a hydraulic conveyor would, says Mr. Thompson, be ideal, and would successfully meet the requirements of many engineers throughout the country who still have a leaning towards horizontal carbonization, or where coals are not suitable for use in vertical plants.

Many engineers have inspected this trial plant, and we understand that Messrs. Drakes have many enquiries for attention in post-war days, when the firm naturally hope to be in a position to put some interesting information before the Industry. They are anxious to produce a better domestic fuel, and they hope the system they have introduced will meet this requirement.

Liverpool Gas Company

The Ordinary General Meeting of the Liverpool Gas Company was held on Feb. 22. Lt.-Colonel Albert Buckley, D.S.O., J.P., Chairman, said: As in previous years we are under strict limitations in respect of the issue of a statement of accounts and report relating to the Company's operations, and therefore to-day's proceedings must be mainly formal. I am not, however, precluded, I think, from assuring you that in spite of further increases in costs the year's trading had yielded a financial result which, in the opinion of your Board of Directors, is considered satisfactory. It has, therefore, recommended in the report the payment of a final dividend of 2½%, making 5% for the year.

The year's working has been carried on under difficult conditions. The demand for gas for industrial purposes connected with the war effort was sustained, and had to be met not only at a time when labour was in short supply, but with coal of a quality which, in peace time, we should have considered to have been below that required for efficient gas making. Furthermore, at the instance of the Ministry of Fuel and Power, we have been obliged to restrict the supply of cookers and other appliances so that only those people were supplied who could show that they had either no alternative means of cooking or heating, or that serious hardship would ensue should we not meet their needs. Unfortunately, this restriction has tended to create in the mind of the public a certain amount of grievance, and has placed a heavy strain on our depleted showroom staff. For these and other reasons, therefore, your Directors would like to pay tribute to all members of the staff for the manner in which they have served the Company and the public during the past year.

Throughout, your Company has co-operated wholeheartedly with the Government in the fuel economy campaign. It is of the greatest urgency that all fuel users should think twice before using fuel for unessential purposes. I say this, fully conscious of the temporary effect this may have on the Company's finances. Nevertheless, your Board of Directors is of the opinion that the urgent national need during the next few months transcends all other interests, and our clear duty lies, therefore, in supporting any measure calculated to relieve an aggravated coal position, and the enormous strain on transport occasioned by the demands of military preparations on a vast scale.

One of the ways in which we have tried to help to foster economy by consumers is in our having supplied and fixed to their meters some tens of thousands of meter-reading cards. The Company's meter readers record the index thereon, and no increased consumption is passed by without the attention of the user having been drawn thereto. There is another sphere in which we have been able to assist the national effort, and notwithstanding that during hostilities our expenditure on publicity has necessarily been considerably curtailed, yet we have managed to hold cookery demonstrations and lectures averaging over one per day throughout the year for the purpose of instructing housewives and others how to make the optimum use of their rations, with the minimum use of fuel.

The theatre and showrooms at Radiant House continue to be in constant demand, particularly by the various Ministries—Information, Food, Agriculture, &c.—with whom we have been happy to co-operate by housing many exhibits of national or civic interest. Of comparatively recent date, H.M. Government has had under review the question of Workmen's Compensation. Your Board of Directors has also been considering this important subject, but from a somewhat different angle. Recent legislation has been designed to supplement the compensation allowances payable as a result of accidents, whereas we have endeavoured to focus attention on accident prevention.

As large employers of labour your Directors feel that our liability to the employees is not sufficiently discharged merely by the payment of compensation unless every step has been taken to prevent accidents happening in the first place. Three specially qualified industrial nurses have thus been appointed (one for each of our three largest works), and they have been charged with the duty of maintaining at the highest possible level the health of the workers on the various gas-works. These nurses, under the Company's doctor, are, of course, available in case of accidents to render first aid, and their professional advice will be at the disposal of the Safety Committees being formed to investigate from time to time such accidents as unfortunately occur, so that appropriate steps may be taken to obviate any recurrence in the future.

It is, moreover, recognized that ill-health or temporary indisposition renders certain individuals more prone to accidents, and therefore by taking adequate measures to prevent or alleviate sickness, the incidence of industrial accidents, so far as this Company is concerned, should be reduced. Furthermore, proper and prompt treatment should not only shorten materially the period of rehabilitation required after illness or accident, with a subsequent reduction in the precious man-hours irretrievably lost through involuntary absenteeism, but simultaneously raise the standard of health and contentment of our employees.

The importance of National Savings in these critical days is fully appreciated by our employees, and I am glad to record that over the past four years the sum contributed to National Savings exceeded £86,500. You will be interested to hear that 820 of our employees are now serving with H.M. Forces and, of course, there are others on full-time Civil Defence. These employees are continually in our minds and we will welcome the day of their safe return. Fourteen have made the supreme sacrifice, 11 are prisoners of war, and 12 are missing. Our sincere sympathy is extended to all their relatives in their loss or anxiety.

I take it that it is now your wish that the report be taken as read.

Dividends

Brighton, Hove, and Worthing.—On the 6% Standard Consolidated Stock, final dividend £2 16s., making a total distribution for the year of £4 15s., and on the 5% Standard Consolidated Stock a final dividend of £2 5s., making for the year £3 10s. Dividends payable March 24.

Tottenham.—Final on Ordinary Stock at 2½% actual, making 5% for the year (the same as for the previous year); on 5% Preference Stock at 2½% actual, making 5% for the year; on 5½% Preference Stock at 2¾% actual, making 5½% for the year, all less tax.

A Meeting of the Liverpool Branch of the Institute of Cost and Works Accountants was held at the Liverpool Gas Company's theatre at Radiant House on Feb. 12. A packed house heard Mr. J. G. O. Drake, the Treasurer of the Company and the Principal Inspector of Taxes for the Liverpool Area, offering suggestions as to how to deal with the collection and recording of "Pay as you Earn" taxes. Mr. Drake said he was quite sure "Pay as you Earn" had come to stay, and that the system of deducting income tax weekly would probably reduce the sensitiveness of the non-manual worker to the National Budget by reason of the fact of the absence of half-yearly demand notes.

An Important Development in the manufacture of long length copper tubes opens up the prospect of more extended use of this metal for water and gas service pipes between main and house. Hitherto the general assumption has been that 30 ft. was the maximum length obtainable. As a result of I.C.I. research, lengths up to 75 ft. can now be supplied in coil form for easy manipulation and transportation. The saving in installation costs by the use of such long lengths of copper service pipes is considerable. Fewer connexions are needed. Laying of the pipes in trenches is facilitated and they can be run round obstructions. The tubes can be bent by hand. Annealing or the use of mechanical appliances is not necessary.